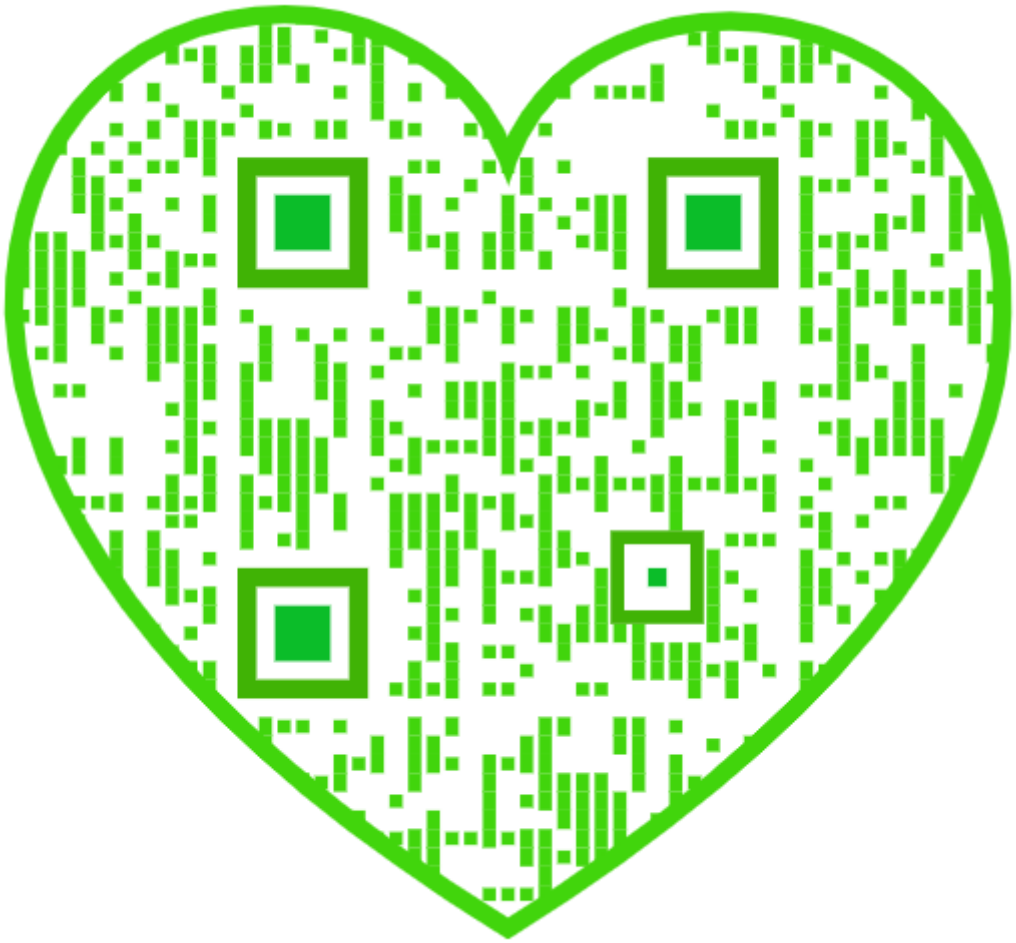
S
613
I7

Irrigation guide.



Class S613

Book .I7

Copyright No.

COPYRIGHT DEPOSIT.

LIBRARY OF CONGRESS
COPYRIGHT
JUN 3 1895
CITY OF WASHINGTON.

23086-aa

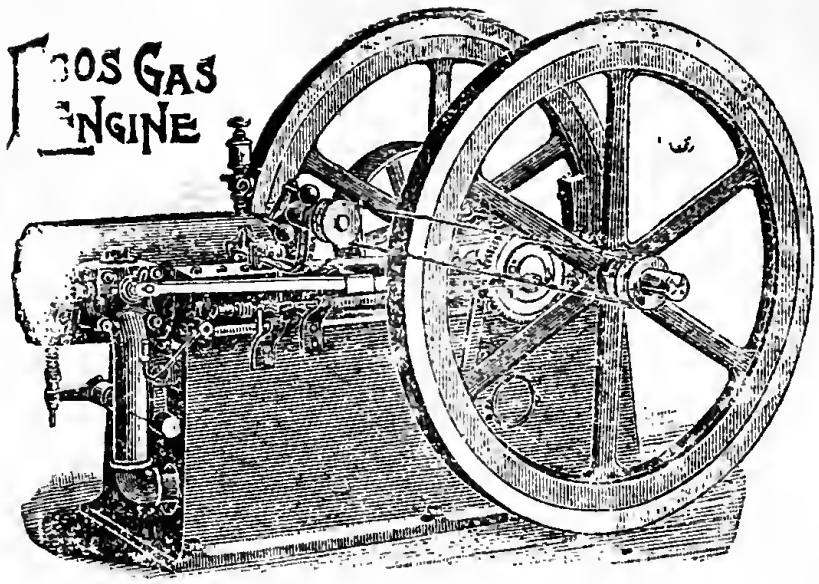
IRRIGATION GUIDE.

A concise treatise on IRRIGATION. Designed for the practical Farmer, who is convinced of the advantages of irrigation, but does not know how to practice it.

Copyrighted, 1895 by A. J. Kenney.

LIVINGSTON, MONTANA.

S613
I7



Irrigation.

THE CHEAPEST

IRRIGATION

Can be had

with GASOLINE ENGINE and pump. we can furnish Engines from 2 to 50 horse power that are RELIABLE DURABLE, AND ECONOMICAL.

Cost of operating. one cent per horse power per hour. We furnish free with every Engine an Electric BATTERY to explode the Gas, that will last 4 months without any attention then it can b renewed and will last 4 months more, andso on for all time. We do not use a red hot tube to explode the gas that has to be replaced with a new one almost daily.

Foos Gas Engine Co.,

SPRINGFIELD, OHIO.

INTRODUCTION.

When we reflect, kind reader, upon the wonderful growth of population of the United States, that we are nearly doubling in numbers every twenty years, and when we remember, that the science of the age has banished pestilence, and that the humanity of the age is fast vetoing war, then will we see that the limit of food supply is the only limit to the increase of our population. The number of acres of agricultural land, cannot be doubled for each successive generation, The available Land, is now practically occupied. Then how shal food production, keep pace with the increase of population? The question is answered in the magic word IRRIGATION. without water, neither plant nor Animal life can exist. Neither can a Plant attain perfection, if deprived of sufficient moisture at any stage of its growth. Drought is the most prolific cause of failure of crops, while irrigation not only makes crops sure but doubles, and quadruples the yield.

The Secretary of Agrienlture says, "Congress, realizing that Irrigation is in a sense, a new agricultural question, has charged the department, with its consideration, Not for the West alone, but for the East as well. There are Seasons, when a little water, properly dis-

tributed, would add immensly, to the products East of the Mississippi."

There are thousands of Farms east of the Mississippi, that could be irrigated with small expense, compared to the advantage to be derived. Corn lands, that usually make 40 or 50 bushels per acre, would with one or two irrigatings, during the dry time in July and August, make 80 to 100 bushels per. acre. Wheat lands, producing 10 to 20 bushels per. acre, ought with one irrigating, make 30 to 60 bushels per. acre, and so on. throngh the list.

It is not uncommon in the west, to see Irish Potatoes weighing 3 and 4 pounds each, or wheat turning off 40 and 60 bushels per. acre. and Oats 100 bushels per. acre, with no apparent advantage, except water when needed.

This little work, however is intended for the practical Farmer, East, West, North, or South, who is convinced of the advantage of Irrigation, but does not know how to practice it.

SURVEYING.

The first thing in Ditch construction, is to survey and stake off your ditch.
You need not pay a professional surveyor for doing it, but can do it your self.
For a surveying instrument, use a board, sixteen and one half feet long, eight inches wide, and one inch thick with one straight edge. The other edge should be dressed off, leaving the board eight inches wide in the center, and sloping down to about four inches at each end. This to make it light, and leave it strong, to avoid springing. Then nail on each end of the board, a leg, about thirty inches long. The legs should be exactly the same length.

Fig 1.

Now you want to find a perfectly level surface, for adjusting your spirit level on the board. Perhaps the easiest and most simple way, is to find a shallow pool of standing water and drive down two pegs, just sixteen and one half feet apart,

and just to a level with the waters surface. place the legs of the board, on these pegs, adjust your spirit level, on the cer of The board, so the bulb indicates level. fasten the level securely, so that it cannot jar loose, or vary. Now your surveying board is simply a big level, on legs but you do not want to make your ditch level, so having decided the amount of fall you wish to give your ditch, say one eighth of an inch to the rod, then you want to saw off that much from one leg of your board. Then mark that end S. for short, and in surveying, allways run the short end, toward the the head, or source of the ditch.

Now, put a screw, in each end of the board, for sights. Let the sight on S. end, stand one eighth inch, higher than the sight on the other end. See Fig. 1.

If you have faithfully followed instructions, you have a surveying board that will do the work just as correctly, as the most expensive surveying instrument made.

Now to survey a ditch. Commence at the highest point of land that you propose to cover with your ditch. Set the surveying board with S. end pointing toward the source of water supply. Move S. end until level is indicated. Then have your helper drive a stake at the foot of S. end. If the land is sloping, drive the pegs on the lower side. Then move up setting the long leg at the stake, just where the S. leg was. move S. leg about until level

is indicated, then drive stake as before. The stakes are to mark your survey so you can find and follow it afterward.

In surveying across a swag, or depression, which you mean to fill, or a hollow or gulch, which you mean to flume, or a steep hill side, that you can not stand on, you proceed as folows. Take a board three feet long, and three or four inches wide, set at S. end of surveying board. and mark a spot for a target, just as high from the ground, as the top of the sight on the S. end of surveying board.

Now with the S. end setting at the last peg drove, turn the other end until the board points straight across the swag, gulch, or bank. Lower, or raise the long leg, until level. send a man across with the Target. let him move it about. until the target comes in line with the sights. Then drive a peg at the foot of the target. Then move up to this peg and proceed as before.

In surveying for Flumes, you should if possible, give one inch fall to the rod. In order that less, lumber, and work will be required in its construction.

And that less weight of water will be on the flume. As a given volume of water, flowing through a flume at the rate of two feet per. second, would be reduced in weight one half, if sent through at the rate of four feet per. sec.

Then to survey with more fall, raise the sight on S. and of board, as much as you want to increase the fall. Having finished your survey to the stream, you are ready to begin the construction of your ditch.

Ditch Construction.

First, it is necessary to decide on the size of your ditch. In the West, one inch of wa-ter, is calculated to irrigate one acre of land.

Water is measured thus, in Montana. A box is constructed, with a Head Gate, so as to leave an opening of six inches, between the bottom of the box, and the lower edge of the gate. The box is placed level, and so arranged that the stream, in passing through the aperture, is not obstructed by back water, or an eddy below the gate, but before entering the opening the stream should be brought to an eddy, and stand three inches on the Head Gate, and above the top of the opening. The number of square inches coutained in the opening, is the measure of the water.

By this way of measureing, it will take about two square inches of ditch, to carry one square inch of water, giving one eighth inch fall to the rod. Of course, a ditch will carry more or less, according to the fall you give it, but the

more fall, the longer the ditch will be. and in land that is liable to wash, one eighth of an inch to the rod, will be about right. But if necessary, water can be made to run with one thirty second of an inch fall to the rod.
We will suppose how ever, that you want to irrigate eighty acres, and will require a ditch two feet wide, and nine inches deep.

Now, begin at the last survey peg, which is at the waters edge, and on a level with it. Dig and shovel out a ditch of above dimensions, until it is made away from the creek, and onto ground that can be worked with a team and plow.
Then use four steady horses, and a road, or grading plow, start in where you left off diging, and plow deep, follow the survey pegs, just pl wing them up.

Lay off as long a stretch of the ditch, as seems best. Then plow back in the same furrow, and if not thoroughly plowed as deep as nine inches, keep plowing in same furrow, until it is. Then plow two other furrows the same way.
Now to clean out the loose dirt, take a big solid log, ten feet long, that will square two feet, hew square then cut each end just in the shape of a big turning plow.
Make the bottom a little concave, so as to leave the points press well to the ground.

In the top side of the log, and at each end, put in good strong hooks, or eyes to pull by. Then if you like, you can put on handles to hold it steady.

Now, hitch your four horses, on this and drag through the ditch, then put to the other end, and drag back when you will have most of the loose dirt out.

After this, you should go over with pick, shovel, and surveying board, and finish up, by working off the high places.

Set the surveying board in the bottom of the ditch with S. end just nine inches below the water level, and if the other end is too high, dig down until level is indicated. smooth off between the two legs, as near as you can by the eye. Then move up, setting S. end just where the long leg was, and proceed as before.

and so on through, as far as you have plowed.

Then turn in a little water, to test if it will run, which it will be sure to do, if you have made no mistakes.

It is well to all ways be careful, and systematic. remembering that what is worth doing at all, is worth doing well.

Do not lay off too much at once, but rather finish up as you go, and test it by runing water through it.

A large proportion of irrigation ditches made, are made the first time, up hill. In such cases,

there is no other remedy, but to make a new ditch.

Before going too far, put in a good substantial Head Gate to let the water in or turn it out. It should be put in so that it will not wash out, and should be of sufficient height to prevent overflow.

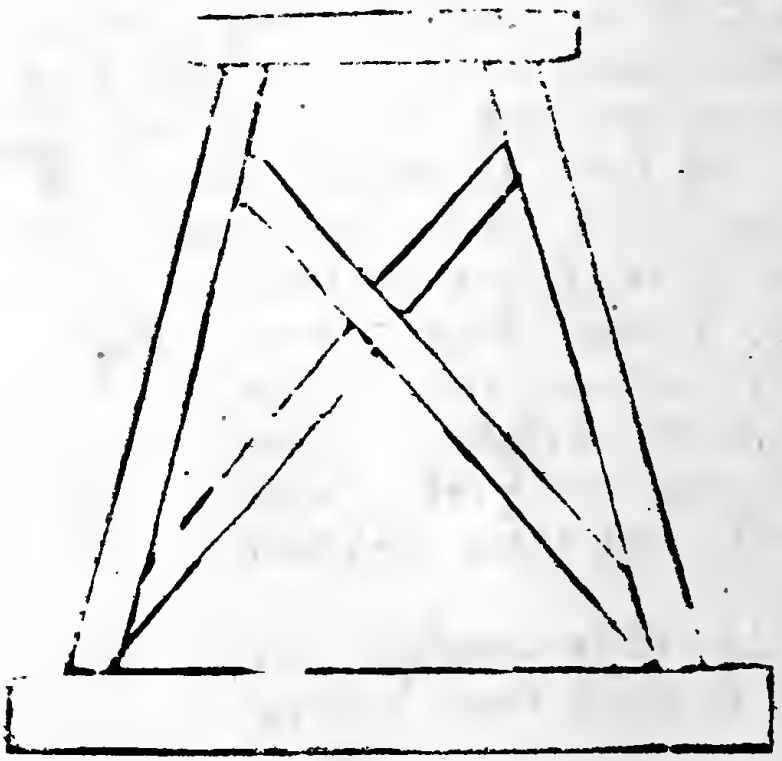
If a larger ditch is desired, than the one described, there is probably no better way, than to use ordinary R. R. scrapers, for moving the loose dirt. Three teams, with drivers, and one man to fill scrapers, is about the best crew. The drivers dumping the scrapers. This way, the ditch should be plowed as wide as wanted, then scraped out, then plowed again and scraped dumping in the vacant places, to make a solid bank of the loose dirt.

Which will require about three plowings and scrapings.

Flumes.

We now suppose that you have finished the ditch to the bank of a gulch, that you want to flume. the lumber to be used, for the size ditch under consideration, should be twelve or fourteen inches wide, and one and a half inches thick, and sixteen and a half feet long for bottoms. Ten or twelve inches wide, one inch thick, and sixteen and a half feet long, for sides. Four inches square, for uprights, and two by four inches for caps. The ground sills should be six by six, or round timbers of simular size, hewed on top side. Fig. 2. shows manner of constructing supports.

Fig. 2.



For convenience in sawing slopes of uprights you should make a big wooden square, as shown in Fig. 3. make it of six inch board. the blade sixteen feet, long. Tongue four feet, and sliding tongue two feet long. Mark it off correctly in feet, inches, and fractions.

Now take a log or timber, six or eight feet long, and bury across the ditch, at the commencement of the flume, this to anchor the flume to. put it down one and a half inches below the bottom of ditch. The top side of leg should have a smooth face, to nail the bottom of flume to. After it is in place and level, tamp in dirt, level with the face of log. Now, with a straight edge, sixteen and a half feet long. Measure for the place to set the sill, for the first upright timbers to set on. Measure on a level, set the sill in the ground, set it level and square across. Now with the straight edge, on the first sill. Measure the height from second sill, up to level with the first sill, say three feet and one inch.

Then set the slide tongue of the square, at three feet. leaving

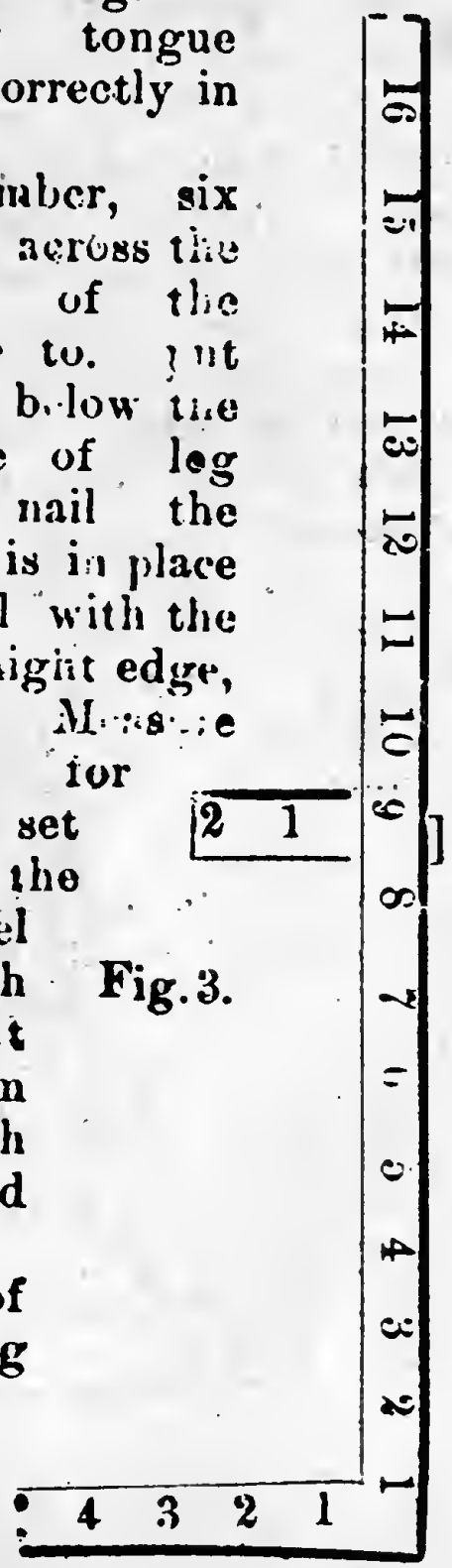


Fig. 3.

off the one inch, for fall to the flume.

Now to get the slope, to saw the uprights, place the square on the timber, with the top end of timber, at one on slide tongue, and the other end at two on stationary tongue of square. Mark on the heavy lines as shown in Fig. 3. Saw, and mortise on cap, which should be two and a half feet long, leaving three inches outside each mortise, nail on braces, as shown in Fig. 2. Now set up in position, and toe nail bottoms to sill. Then nail on the bottom of flume, and set a brace under the center of flume bottom. Now measure, and set the sill, for the next set of uprights. Then with your straight edge, and level, find the distance between the level of sills number three, and sill number two, say two feet and eleven inches.

Leave off one inch for fall, take two feet ten inches, and add to the height of the last set of uprights, which was three feet. That gives five feet ten inches, take off one inch for fall, set slide tongue at five feet nine inches, lay your square on the timber, top end as before and bottom end at two feet six inches. Giving wide base, as the uprights get longer. Mark, and saw, mortise, brace, set up and nail as before, and so on until you reach the deepest part of the gulch.

We now suppose, that at the deepest part of the gulch, your uprights are sixteen feet long

measure and set the sill for the ascending side. Find difference in levels of sills, say four feet.

Now to get height of uprights, take four from sixteen, equal twelve. take one inch off for Fall. Set slide tongue, at eleven feet and eleven inches place square on timber, with top end at one. And three feet six inches at bottom. Mark, saw, mortise and cap, brace, set up, toe nail, nail on Flume bottom. Measure and set next sill, find difference in levels of sills; say three feet ten inches; which take from the hight of last uprights, (eleven feet and eleven inches,) equals eight feet and one inch. Take off one inch for fall. Set the square at eight feet. Lay the square on timber at one top. And three at bottom mark, saw, mortise, cap, brace and set up. Toe nail, nail on Flume bottom. Measure and set next sill find difference in levels. Say three feet and eleven inches, which take from eight feet. equals four feet and one inch. Leave off one inch for Fall. Set square at Four Feet. Place square on timber at one top, and two at the bottom. Mark. saw, Mortise cap, Brace, setup and toe nail, nail on Flume bottom. Measure for next sill, which we will say reaches the bank; where you want to bury a log as at first; to anchor Flume to. Put it down one and a half inches below level with cap of last set of uprights. Tamp in earth, and nail on Flume bottom. Now nail on the side boards of the Flume. Nail blocks on outside

at joints. Then at intervals of eight and one fourth feet, nail on binders, to keep the Flume from spreading, or warping.

Your Flume now being finished, turn in a little water to test it.

To make a Fill, across a swag, or depression, you proceed similar to making a R. R. grade. Plowing each side, and scraping dirt to center. Until you have a grade high enough to make Ditch on. Make a Culvert through the embankment, at the lowest part of the swag; for rain water to pass through.

Dams.

It is often the case, that you can not start Ditch, at the water level; on account of cut banks; or other causes. In such cases, it will be necessary to make a Dam; to raise the water, to a level with the Ditch.

For this purpose, nothing answers so well, as brush: Willow or other long brush. Cut and bind the brush with wire, in bundles, as large as two men can handle. Place a layer of these bundles, in the creek bed; with the tops up the stream. Then throw in dirt, gravel, and rock, to fill in and weight these down.

Then another layer of brush. And so on until the water is raised to the desired height. Then cover with rock.

Reservoirs.

If there is no running Stream near you that you can appropriate for irrigating purposes; Then perhaps the next best plan is to build a reservoir, to catch water in time of rain or melting snow, and hold it until needed by growing crops.

A reservoir containing one acre, and holding water to an average depth of ten feet; will irrigate about forty acres, one time.

For a resevoir site, select a swag draw, or depression, above the level of the land to be irrigated. A clay soil, or a soil resting on a clay subsoil, is best. If the draw is independent of the main draw, which you aim to catch water from, all the better. As you can thus fill the reservoir, by ditch connection with the main draw: and avoid danger of overflow.

To build a dam; or embankment for a reservoir; the place where it is to be constructed, should be cleared of all vegetation and debris. And thoroughly prepared, by plowing, or trenching, or both. So that the earth composing the embankment, shall be firmly united therewith, at the ends, and at the bottom, and the earth should be spread evenly, and in layers, not exceeding a foot in depth, and so dampened, tramped, packed, rolled or trodden down, as to form a thoroughly compact mass. A cross section of

such dam, should be of the following proportions. The width at the base, should be, not less than five times the proposed height. And the width at the top, should be not less than half the height. And the slope of the outer face, should not be more then one foot of rise, to one and a half feet of spread. and the slope of the inner face, next to the water to be held back, should not be more than one foot of rise, to three feet of spread.

The inner face of the dam, or embankment, should be faced with stone or timber to resist wave action. No water should be allowed to flow over the dam; but proper wasteway made to allow the escape of surplus water.

Before commencing the embankment, you should put in, near the lowest point of reservoir, a good strong box with suitable gate, for leting the water out for use. The box should be a few feet longer than the width of base of embankment, and should be well tamped around. In some soils it is necessary to puddle the reservoir, to keep the water from seeping away. Puddling is done by removing all the sod, or vegetation. Then thoroughly plow and pulverize fine, the whole surface, and turn in water, then run over it with a drag, made of boards, laped, like weather boarding.

This will practically render it impervious to water.

Irrigating in a small way, for gardens, and truck patches, can be done to advantage, by elevating water from wells, or otuer sources of supply. Stor -ing the water in small Reservoirs. and where the elevation is not too great, and the water supply is sufficient, this can be done quite extensively. There are various ways of raising water, among which are. Hydraulic Rams, run by water its self. Link Belt Elevators, And pumps, run by water wheels, Wind mill, Ho s , Steam, or Gas power.

Applying Water to Crops.

Grain should usualy not be irrigated until it has made sufficient growth to shade the land, as the land tends to run together pack and bake, when exposed to the direct rays of the sun, after being irrigated. Hence, the importance of conserv -ing the moisture, furnished by spring rains. This is accomplished by deep plowing, and thorough pulverization of the soil, before planting, or sowing; and in hoed crops, by frequent cultiva tion.

The water should be conducted in the main ditch, to, and along the highest part of the field to be irrigated. Grain, Hay, and other crops not grown in rows, are irrigated by Flooding. that is, the water is made to flow over the whole

surface of the land, if the land lays comparativly level, or gradualy sloping, but not undulating the side or lateral ditches should be made running with the greatest slope of the land, commencing at the highest and running direct to the lowest part of the land. The ditches are made by running an ordinary stiring plow twice through; throwing a furrow each way; these furrows form rims to the ditches for keeping the water in bounds of the strip being irrigated. These ditches should be about thirty three feet apart and over the whole field and can be made any time after the grain or crop is sown. Now make a dam across the main ditch so as to turn the water in between the first two side ditches, take your position in front of the water and with a shovel keep the water flowing evenly over the thirty three feet space not allowing it to break over the rims in to the ditches. as soon as the water runs through to the lower end of the land, Change it to the next space. If the water is kept flowing evenly over the spaces the subsequent irrigatings will be quite easy.

If the land is undulating then the side or lateral ditches must be surveyed, and run on grade, same as main ditch. In this case the ditches should be from sixty to one hundred feet apart and The rims all on The lower sides.

To irrigate in This way. begin at highest point of The land, put a dam in The main ditch

so as to turn the water out on a space of thirty or forty feet. Guide along and spread evenly until it reaches the next ditch below: then put in a dam in that ditch, and guide and spread the water until it is caught in the next ditch, below, and so on until the field is crossed.

Then go back to the main ditch, and begin another space in the same way, and so on through.

In irrigating Hoed crops, the rows should be laid off in a direction that will allow the water to run freely, but should not be steep enough to wash. Hoed crops should not be flooded, but should have furrows run between the rows, allowing the water run in these furrows: turning a small stream in each row. NEVER allowing it to come in direct contact with the plant.

Do not allow the water on longer than necessary, for the moisture to meet in the subsoil under the row, which you can tell by sticking down a shovel.

It is the water returning to the surface, from below, that does the plants most good.

Cultivate, as soon as dry enough, after each irrigating.

Do not commence to irrigate until it is realy necessary, but after commencing, never allow the land, to become dry.

A little water applied often is the best rule for hoed crops.

The IRRIGATION AGE.

"Water is the God of the Harvest."

INDISPENSABLE TO THE

FARMER FRUIT GROWER

ENGINEER, CONTRACTOR,

INVENTOR, HOME BUILDER.

Should be in every home in America. * The only Magazine of its kind in existance, *

MONTHLY. ILLUSTRATED $2.00 per. year.

The Irrigation Age.

511 Masonic Temple. CHICAGO.

☞ Sample copies 10 cents-

LIBRARY OF CONGRESS
0002595841A